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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 16865-2023

Replacing GB/T 16865-2013

**Test pieces and methods for tensile test for wrought aluminium,
magnesium and their alloy products**

变形铝、镁及其合金加工制品拉伸试验用试样及方法

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1 Scope

GB/T 16865-2023 is the Chinese national standard on test pieces and methods for tensile test for wrought aluminium, magnesium and their alloy products, in the field of metallurgy. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 6 August 2023 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 March 2024. Classification: ICS 77.040.10, CCS H22. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This document specifies the specimen requirements and test methods for the tensile test of wrought aluminum, magnesium and their alloy products. This document is applicable to the room-temperature, high-temperature and low-temperature tensile test of wrought aluminum, magnesium and their alloy plates, strips, foils, pipes, rods, profiles, wires, forgings and other processed products.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 3246 (all parts) Inspection Method for Structure of Wrought Aluminum and Aluminum Alloy Products

GB/T 8170 Rules of Rounding off for Numerical Values & Expression and Judgement of Limiting Values

GB/T 10623 Metallic Material - Mechanical Testing - Vocabulary

GB/T 12160-2019 Metallic Materials - Calibration of Extensometers Systems Used in Uniaxial Testing

GB/T 16825.1-2022 Metallic Materials - Calibration and Verification of Static Uniaxial Testing Machines - Part

1.Tension / Compression Testing Machines - Calibration and Verification of the Force-measuring System

GB/T 22638.11 Test Methods for Aluminum and Aluminum Alloy Foils - Part 11. Determination of Mechanical Properties

GB/T 34104-2017 Metallic Materials - Verification of the Alignment of Testing Machines JJG 139 Tension, Compression and Universal Testing Machines JJG 475 Electronic Universal Testing Machine JJG 762 Extensometer JJG 1063 Electro-hydraulic Servo Universal Testing Machines

3 Terms and Definitions

The terms and definitions defined in GB/T 10623 are applicable to this document.

4 Method Overview

Apply axial tension to the specimen (see Figure 1) and determine the mechanical properties of the specimen. In accordance with test temperature, tensile test is divided into three categories.

5.1 Testing Machine

5.1.1 The testing machine force measuring system shall be calibrated in accordance with JJG 139, JJG 475 or JJG 1063. The accuracy of the testing machine force measuring system used for the determination of room-temperature tensile mechanical properties of aluminum foil products shall reach or be superior to Level

0.5 specified in GB/T 16825.1-2022. The accuracy of the testing machine force measuring system used for the determination of mechanical properties of other products shall reach or be superior to Level 1.

5.1.2 The maximum load required for the test should be within the range of 10% ~ 90% of the maximum load of the testing machine.

5.1.3 Testing machines used for the determination of elastic modulus or mechanical properties of aviation and aerospace materials shall be inspected for coaxiality in accordance with GB/T 34104-2017.

5.2 Extensometer

5.2.1 The extensometer system shall be calibrated in accordance with JJG 762. When determining the elastic modulus, the accuracy of the extensometer shall reach or be superior to Level

0.5 specified in GB/T 12160-2019; when determining other mechanical properties, the accuracy of the extensometer shall reach or be superior to Level 1.

5.2.2 When determining the elastic modulus, the extensometer system shall be able to measure the average deformation on at least two opposite sides of the specimen. When adopting the automatic method to determine the plastic strain ratio, the extensometer system shall be able to measure the deformation in the length direction and the width direction of the rectangular specimen.

5.2.3 The gauge length of the extensometer (L_e) should be greater than half of the original gauge length (L_0) and not greater than the original gauge length (L_0); when using an extensometer to determine the elongation after break, the gauge length of the extensometer (L_e) shall be equal to the original gauge length (L_0).

5.2.4 The part of the extensometer used for high-temperature tensile test or low-temperature tensile test that extends outside the heating device or cooling device shall be able to prevent interference from air flow.

5.2.5 Non-contact extensometer should be used for the determination of room-temperature tensile mechanical properties of aluminum foil.

5.3 Fixture The test fixtures can be wedge-shaped fixture (see Figure 2), flat-pushing fixture (see Figure 3), shoulder fixture (see Figure 4), collar fixture (see Figure 5), threaded fixture (see Figure 6) and pin fixture (see Figure 7), etc. The clamping surfaces of wedge-shaped fixture and flat-pushing fixture can be serrated surfaces and smooth rubber surfaces, etc.

5.4 Data Collection System When determining the elastic modulus, data shall be collected through a computer. The minimum data collection frequency (f_{min}) of the data collection system is calculated in accordance with Formula (1), and the value is expressed in Hertz (Hz). The calculation results are expressed to one decimal place, and numerical rounding is carried out in accordance with the stipulations of GB/T 8170.

6 Specimens

6.1 Classification of Specimens In accordance with the gauge length, specimens can be classified into proportional specimens and fixed gauge specimens (non-proportional specimens). The category and cross-sectional shape of the specimens shall comply with the stipulations of Table 2.

6.3.1 Specimen selection principle

6.3.3 Extruded (or drawn and rolled) rods, wires, pipes or extruded profiles and extruded